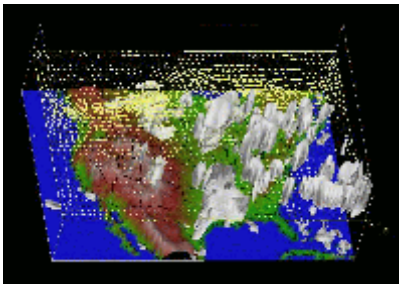
# Air Resources Laboratory

## *The air as a part of our global environment*



An output from ARL's "Models-3," the premier air quality model in the USA. The map shows three-dimensional wind fields derived from NCEP's Eta model for 3 July 1999. 'Jet-level' wind vectors are shown in yellow, and 3-D resolved clouds are shown in white.

The ARL instrumentation pod mounted beneath a light aircraft, and showing the Ka-band scatterometer normally used for studies of air-sea interaction and surface waves.

Instrumentation at the Desert Rock, NV, site of the ARL SURFRAD program. SURFRAD is the nation's surface radiant energy balance monitoring network.

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### What does the Air Resources Laboratory do for the nation?

The Air Resources Laboratory (ARL) studies processes and develops models that relate to air quality and climate, concentrating on technology development and transfer relating to the transport, dispersion, transformation and removal of trace gases and aerosols (the exchange between the atmosphere and the surface), and the role of natural variability. The time frame of interest ranges from minutes to that of the global climate.

ARL research is aligned with the three thematic areas of NOAA Research (weather and air quality, coastal and ocean resources, and climate) with emphases on emergency preparedness, coastal ecosystems, and arid-zone environments. A new theme relates to technology development and transfer. The specific goal of ARL research is to improve and eventually to institutionalize prediction of air quality, atmospheric deposition, and related variables. ARL operates with research divisions in Idaho Falls, Idaho; Research Triangle Park, North Carolina; Boulder, Colorado; Las Vegas, Nevada; Oak Ridge, Tennessee; and Silver Spring, Maryland.

### Recent Accomplishments:

- Quantify the response of the atmosphere to the decreases in pollution emission rates mandated by the Clean Air Act Amendments of 1990. ***Payoffs: ARL monitoring data reveal that there is nearly a one-to-one correspondence between reductions in sulfur emissions and sulfur air quality across the eastern USA, but with some regions benefitting far more than others.***

- Provide a new generation of air quality model for use in regulatory programs and for exploring control options. ***Payoffs: MODELS-3 was delivered to the air quality community, a result of collaboration with the EPA.***

- Improve and deploy modern high-tech systems for deriving air-surface exchange rates (evaporation rates and pollution deposition, for example) using aircraft. ***Payoffs: The "Best Available Technology" turbulence probe is now a widely accepted tool used by scientists worldwide in studies of how the air and the surface interact.***

- Provide a system for forecasting dispersion, fully coupled with the weather forecast products of the National Weather Service, and easily accessible by emergency managers. ***Payoffs: The Realtime Environmental Applications and Display SYstem (READY) is now an accepted NOAA product, available through ARL (see http://www.arl.noaa.gov/READY )***

## What's Next for ARL?

Scientific Challenges in the next five to 10 years:

- Demonstrate a fully coupled meteorology and air quality modeling system in a routine forecast mode, to provide guidance to air quality managers, private forecasters, environmentalists, and the population at large. The challenges are to improve upon existing statistical methods, and to integrate modeling and statistical methods in a routine operational system.
- Complete an experimental assessment of continental-scale source-sink budgets for various trace gases, especially carbon dioxide. This will answer questions related to whether the USA is a net source or sink for carbon dioxide, and about the contribution of human activities.
- Develop and demonstrate an integrated atmosphere/biosphere pollution transport and accumulation model, suitable for constructing regulations addressing the total environment rather than some specific compartment of it.
- Provide routine information on the surface boundary condition for the next generation of mesoscale weather forecasting models – the Weather Research and Forecasting model (WRF). This will require expansion of the ARL Surface Radiation (SURFRAD) program, and coupling with other surface flux programs such as Ameriflux (in which ARL is also a major player).
- Complete an assessment of atmospheric mercury and other toxic trace substances, with special attention to high latitudes and other sensitive ecosystems.
- Improve and implement a forecasting system for smoke and haze, for the continental USA.

## Research Partnerships:

ARL is in partnership with many universities and university consortia. Principal among these are the University Corporation for Atmospheric Research, Oak Ridge Associated Universities, and the following NOAA Cooperative/Joint Institutes. ARL is also in partnership with other federal agencies, including the EPA and the Department of Defense.

- The Cooperative Institute for Atmospheric Sciences and Terrestrial Applications (CIASTA), located in Las Vegas and Reno, Nevada, is a NOAA cooperative institute with the Desert Research Institute (DRI) of the University and Community College System of Nevada (UCCSN).
- The Cooperative Institute for Research in the Atmosphere (CIRA) located in Fort Collins, CO, is a cooperative institute between NOAA and Colorado State University.
- The Cooperative Institute for Research in Environmental Sciences (CIRES) located in Boulder, CO, is a cooperative institute between NOAA and the University of Colorado.

## Budget and Staff:

ARL is a $17.2 million laboratory ($3.3 million in NOAA base), with 146 employees including 110 federal, 14 university, and 22 contract employees.


**For more information, contact:**

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